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17. ABSTRACT (MAX. 250 WORDS)

Using trigonometry as an example, a report on the use of the overhead transparency projector as an audiovisual aid in concept building is presented. Some advantages over the conventional chalkboard method are: (1) Overlays may be so attached that any problem or diagram proceeds from the simple to the complex before the student's eyes. (2) Facing the class, the instructor can be more certain of appropriate tempo; there is no long delay while the instructor writes on the blackboard. (3) Extraneous material previously applied is easily covered so that all attention is concentrated on the idea under discussion. (4) A light is focused on the screen, which is a psychological aid in focusing attention. (5) Overlays, properly attached, make possible instant and complete review of all or any part of any lesson. (6) Instructor time spent in lesson preparation is decreased.

Overhead projection methods aid in concept building but do not substitute for student ability and effort. Abstract thinking should be developed once concepts have been built through audiovisual methods, and care should be taken to avoid complete dependence on physical aids.

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How Overhead Projection Improves Instruction

From an article by Robert M. Sekerak, Head, Department of Audiovisual Communication, California State Polytechnic College, Kellogg-Voorhis Campus, Pomona, California which appeared in Teaching Tools, Summer 1958.

Are we really serious about better teaching in mathematics? Everybody seems to be talking about better instruction but little is being done about it. We hope here to stimulate some thinking about improving instruction in trigonometry by using audiovisual methods.

In most school systems mathematics teachers are doing their usually thorough job of instruction in trigonometry. Thorough, that is, as long as class sizes remain small, enrollees are carefully screened, and instructors have had adequate training. The difficulty is that with the present emphasis on mathematics more and different kinds of students are being urged to enroll for a variety of ultimate purposes. To add to the difficulty, many systems have no instructors who have been specifically prepared for courses in trigonometry.

Mathematics teachers usually feel well equipped for instruction with the standard materials. They have their texts, their work sheets and the chalkboard for demonstration and explanation. There is no need here for newfangled aids, this is basically a "thought" course.

CHALKBOARD TOO EXPENSIVE FOR COMPLEX CONCEPTS

It is true that for most simple problems and demonstrations the chalkboard is adequate. For complex, difficult concept building it is much too expensive. It is expensive in time and efficiency.

To waste the time of an entire class while it waits for the teacher to draw figures and long problems on the board is economically unjustifiable. One answer is that a room should be reserved so that the material could be placed on the board the night before. This is economically impossible. Most teachers no

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longer know the luxury of reserving a room for a single subject. A single room would not solve all the problems involved. At any rate, the time used by the teacher to recopy the material between classes is free, why not use it for that purpose?

In the event the instructor has student questions to answer, reports to make out, other preparations, meetings to attend, counselling sessions, and some professional reading to do, he may want to know about an audiovisual method for saving time.

OVERHEAD PROJECTOR SAVES TIME

In trigonometry, for example, the overhead transparency projector can save time in concept building. If a teacher becomes skilled in the construction of transparencies, he can learn to hinge them in such a manner as to make certain he is presenting only one idea to the class at any given time.

Figure 1. (see pg. 24) Overlays may be so attached that any problem or diagram proceeds from the simple to the complex before the eyes of the student.

Figure 2. (see pg. 24) Facing the class, the instructor can be more certain of appropriate tempo. There is no long delay while the instructor, back to the class, laboriously scratches material on the chalkboard. It is during these lapses in time that many potentially successful students lose out. It has been discovered in the teaching of reading that the plodder forgets what he has read at the top of the page by the time he reaches the bottom because of the time lapse. His attention lags and he retains little; so, too, with the problem solver. If in order to prevent this lag, the teacher draws the whole problem on the board beforehand, there is a confusing complex of stimuli before the student at the outset. His attention is not properly centered for sound instruction.

EXTRANEOUS MATERIALS COVERED

In the case of the overhead projector, extraneous material previously applied is easily covered so that all attention is concentrated on the idea under discussion. A further advantage of the overhead projector in this respect is that a light is focused on the screen. This is a psychological aid in sharply focusing attention. The high contrast in black and white also lends to sharpness and clarity. The student does not have to contend with the glare so often found interfering with his ability to concentrate on the chalkboard.

INSTRUCTIONAL TECHNOLOGY - U.S.C. 2107

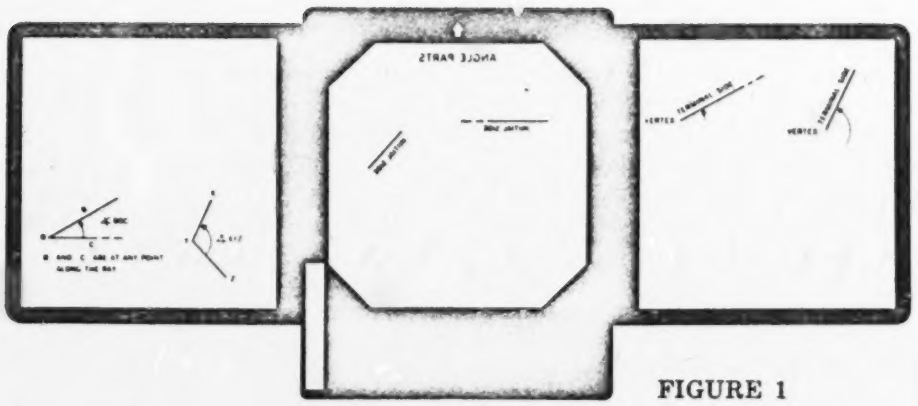


FIGURE 1

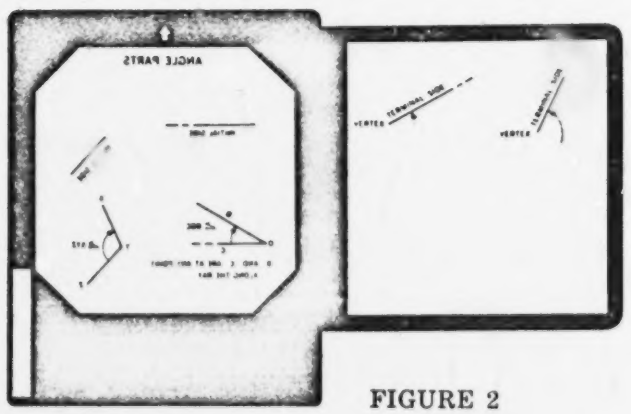


FIGURE 2

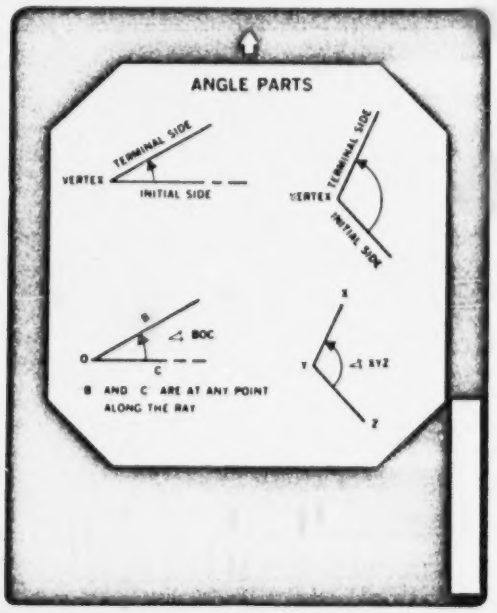


FIGURE 3

The start of the problem is projected on the screen from the center panel alone (Figure 1). Then the left-hand overlay is folded into place (Figure 2). The right hand is moved into position for the final result (Figure 3). The diagram has proceeded from simple to complex before the eyes of the student.

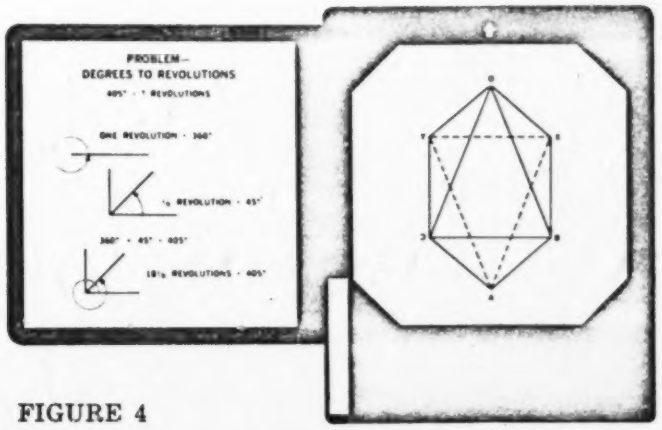


FIGURE 4

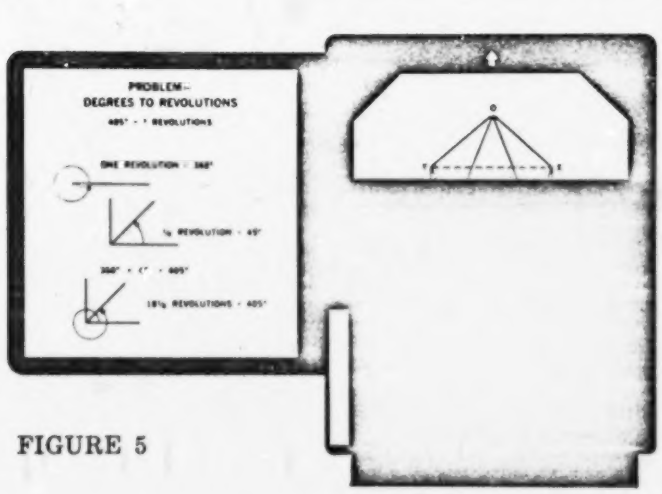


FIGURE 5

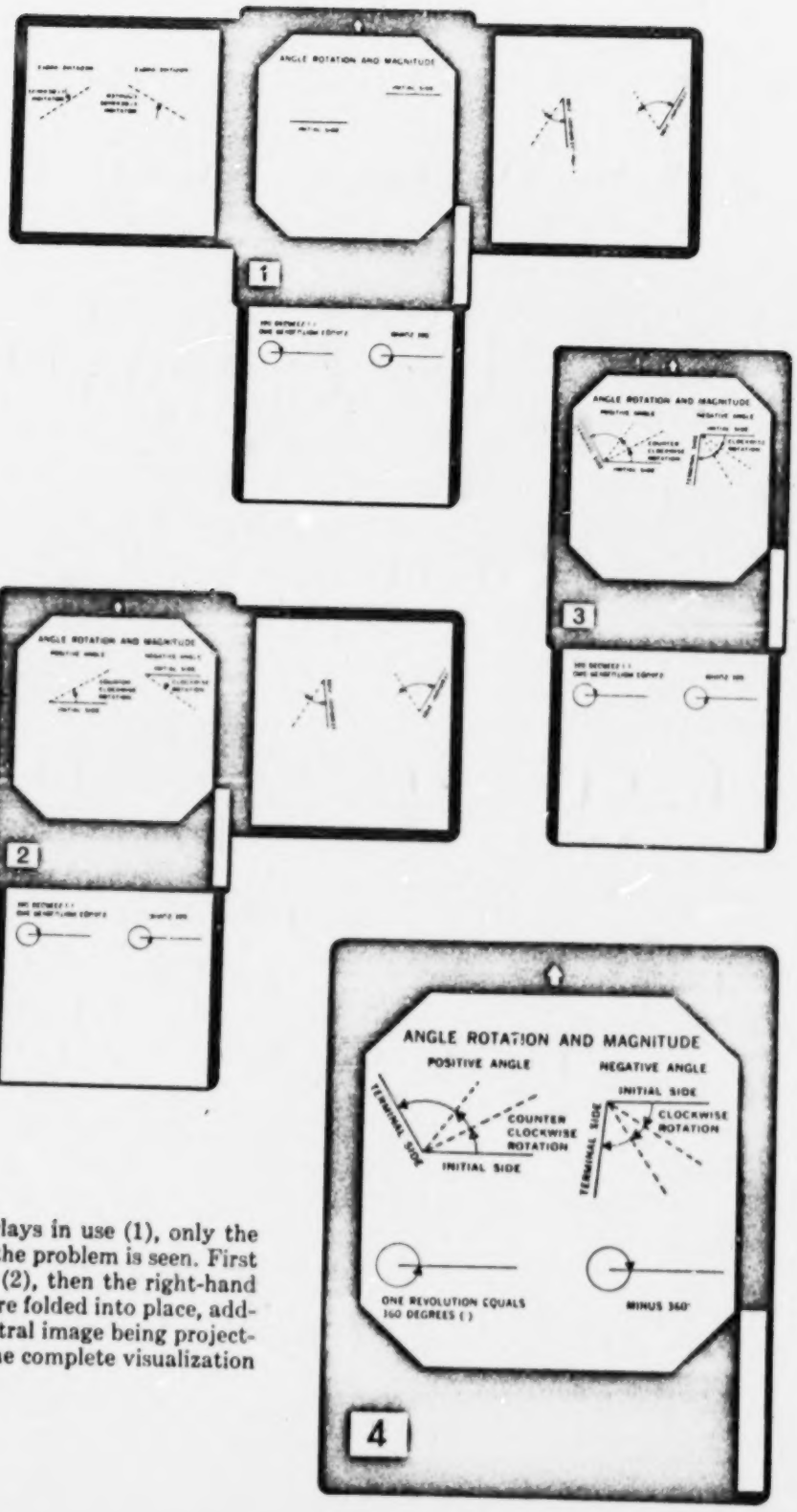
In figures 4 and 5, the complete octahedron is shown first, then partly covered to emphasize a certain point.

The skillful teacher will learn to shade off sections of the material in order to focus attention on the specific material being discussed.

In the case of the octahedron (Figures 4 and 5), the instructor will want to display the entire figure in order to give the students the concept of the whole. He will then want to present the individual triangles as parts of the explanation. This is true in introducing most new materials such as trigonometric functions and the Pythagorean angular relationships. The student should be able to visualize the whole of what he is attempting to solve. Then, each step of the solution can be marked off without delay or confusion. Though this can be done on the chalkboard, it is more difficult, awkward and time consuming.

ILLUSION OF CREATED MOTION

The illusion of motion can be created with overlays. The separation of two rays having a common vertex can be shown by dotted lines and arrows. (See page 26). The gradual separation of



With no overlays in use (1), only the beginning of the problem is seen. First the left-hand (2), then the right-hand (3) overlays are folded into place, adding to the central image being projected. Finally, the complete visualization appears (4).

these rays will produce much the same effect as a motion picture with its Phi phenomenon. The effect makes concrete the abstract concepts of the angle intercepting the arc. Spinning a bent paper clip can produce actual motion on the screen where the occasion demands it.

REVIEW OF LESSON MADE EASY

Overlays, properly attached, make possible instant and complete review of all or any part of any lesson. It is not necessary to waste class time in erasing, then rewriting material to be discussed. Often, because of this waste, there is no time for the vital, necessary review—more students lost. With transparency material, the review is not only possible but easy and pleasant. Time saved in lesson preparation is one of the chief advantages of the transparency. Once a set of overlays is developed, only minor revisions and improvements will be necessary. Time thus saved is available to students who need personal attention, students both of the "gifted" variety and those who would not otherwise be enrolled in trigonometry courses.

AIDS MUST BUILD CONCEPTS FOR THINKING IN ABSTRACT

William C. McIntosh, of the California State Polytechnic College at Pomona, California, one of the country's leading instructors of trigonometry, is quick to point out that though these methods aid in concept building they will not substitute for student effort and ability. He stresses the development of thinking in the abstract once concepts have been built through Audiovisual methods. Care must be taken to avoid complete dependence on physical aids. This is sound Audiovisual doctrine and emphasizes the reason for care in the development of the transparencies. Their value lies in creating an understandable environment for those with keen intellect but improper background. The need is to avoid either leaving these people behind or restraining the "Mathematicians" while the others catch up.

For instructors who have not had sufficient training in mathematics to be confident of their ability to create their own materials, ready-made transparencies are commercially available for any course in high school trigonometry. These may be used until such time that the instructor has sufficient experience to produce his own. With these materials available, however, there is no reason why any school system cannot offer a course in trigonometry if it is willing to apply sound Audiovisual methods.

NUGGETS *

If there is anything that should accompany the use of filmstrips, it is discussion. For goodness sake discuss what you and your students are seeing!

Dr. Irene S. Cypher, Associate Professor of Education, New York University
Reprinted from Educational Screen and Audiovisual Guide—February 1959.

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